



Health Consultation

MATHESON GAS PRODUCTS INCORPORATED

JOLIET, WILL COUNTY, ILLINOIS

CERCLIS NO. ILD148348287

SEPTEMBER 1, 1998

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Public Health Service

Agency for Toxic Substances and Disease Registry

Division of Health Assessment and Consultation

Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

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In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

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CERCLIS NO. ILD148348287

Prepared by:

**Illinois Department of Public Health
Under a Cooperative Agreement with
Agency for Toxic Substances and Disease Registry**

BACKGROUND AND STATEMENT OF ISSUES

The Illinois Environmental Protection Agency (IEPA) requested that the Illinois Department of Public Health (IDPH) review the historical and environmental data available to determine if a public health threat exists at the Matheson Gas Products, Inc. (Matheson Gas) site. Matheson Gas is an active facility that repackages and distributes high purity gases and manufactures carbon monoxide (1). The facility was placed on the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) list in November 1988 due to a request for discovery action initiated by IEPA.

Under the direction of the U.S. Environmental Protection agency (USEPA), IEPA conducted a preliminary assessment (PA) in September 1989, and a screening site inspection (SSI) in June 1991. During the SSI, IEPA collected groundwater samples and soil samples on and off the site (2). Another PA was completed on December 28, 1993, as the first step in the process of ranking facilities for corrective actions. IEPA did a visual site inspection on January 5, 1994. In 1995, IEPA conducted a site team evaluation prioritization visit and collected groundwater, soil, and sediment samples on and off the site (3).

Matheson Gas is at Manhattan Road and Richards Street in Joliet, Will County, Illinois (Attachment 1). It occupies 5.44 acres in an industrial and residential area. Only about 3 acres of land are usable because the remaining 2.44 acres are subjected to seasonal flooding. The facility is bordered on the north by Will County Farm Services; on the east by Richards Street, which ends at the facility; on the south by a residential area and Sugar Run Creek; and on the west by a wooded area (Attachment 2). Industrialized areas are immediately east and northeast of the facility, and wooded areas are immediately south, west, and north. Beyond these wooded areas are residential areas. A wire fence exists on the east and north side of the property, with a locked gate on the east side. The site contains administrative buildings and a loading dock for deliveries, a quarry pond on the southeast part, and a tar pit on the northwest corner of the property.

Matheson Gas has operated at the facility since 1946 and employs about 26 people. Activities began at the site in 1891 when Kirkpatrick, Howk, Massey Stone Company used the area for its quarry operations. The quarrying continued until 1911 when they sold the property to the Joliet Oil Refining Company (Joliet Oil). A 1924 Sanborn fire insurance map shows that several oil tanks, several stills, two pump houses, and a boiler house were present at the site. The property changed owners but continued to be used as an oil refinery until 1946 when Matheson Gas, then a division of Searle, bought the property.

While the property was an oil refinery, the refinery waste was deposited in at least one old quarry pit. An on-site pit, measuring about 125 feet by 30 feet with an unknown depth, contains viscous, petroleum, tar-like waste. This is the "tar pit" (SWMU-8) where Matheson Gas shares the property boundaries with two other property owners. A solid waste management unit (SWMU) is a discernable unit in which solid wastes have been placed and from which hazardous materials might migrate. Adjacent areas also contained viscous petroleum tar-like waste, and Matheson

Gas filled some of them to expand operations. In June 1988 a dog became trapped in SWMU-8, and although it was eventually freed, the dog reportedly died of exposure to conditions in the pit.

Matheson Gas could not provide specific information regarding waste generation and disposal at the site before 1946. During the 1960s, Matheson Gas disposed of scrap cylinders west and north of the quarry pond (SWMU-7) in the cylinder disposal area (SWMU-5). The quarry pond measures about 140×100 feet, with the deepest point at 15 feet. Also, small gas cylinders could have been disposed in SWMU-7. The cylinders may have contained phosgene, chlorine, hydrogen sulfide, and nitrogen dioxide. Matheson Gas has never had any underground storage tanks on the facility's property.

Attachment 3 shows the facility layout and Attachment 4 shows a diagram of facility operations. The current status of the SWMUs at the facility and the sources of wastes are identified in Table 1.

Matheson Gas has more than 100 gases on the site that can be repackaged in different size cylinders to meet the need of customers. They rent the cylinders to the customers, along with any associated gas handling equipment. When customers return the rented cylinders to Matheson Gas, each may contain 1 to 2 percent of remnant gas. The cylinders are cleaned and reused as needed. Currently Matheson Gas does not generate any hazardous waste for off-site treatment or disposal. Nonhazardous wastes generated at the facility include remnant gas, scrubber effluent waste, wastewater, spent filters, and scrap cylinders.

Remnant gas is what is left over in tanks and cylinders that are returned. The excess gas is removed under vacuum from the returned cylinders. About 3,000 pounds of remnant gas are generated each month. To neutralize the remnant gas, they inject it into an acidic or caustic solution and then trickle it through the scrubber unit (SWMU-2) for mixing. This process generates a scrubber effluent waste that is either piped to the waste liquids room (SWMU-1) for reuse, or stored in two, 5,000-gallon tanks within the former hazardous waste storage area (SWMU-3) on the western part of the facility. Solutions in SWMU-1 are used until they are no longer effective and then are piped to SWMU-3. The facility generates about 15,000 gallons of scrubber effluent waste each year, which is carried off the site as nonhazardous waste. The remnant gas is hydrocarbon-based and is vented to the thermal oxidizer (SWMU-4) for incineration. SWMU-4 does not generate any ash or other debris.

Wastewater is generated from cylinder washing operations, cylinder hydrostatic testing, and cooling water. It contains high concentrations of iron solids. The wash and hydrostatic testing waters are filtered in the waste liquids room to remove iron solids. This water is then combined with the cooling water before it is discharged into the facility's quarry pond. About 800 gallons of wastewater are discharged each day. Spent filters are generated during this part of the process and are replaced 1 to 3 times each week. The nonhazardous spent filters are discarded in the facility's dumpster (SWMU-9), along with general refuse. Waste Management, Inc., transports this combined waste to one of its landfills.

Scrap cylinders that fail the hydrostatic test are rendered useless and placed in the scrap cylinder accumulation area (SWMU-6). About 2 tons of scrap cylinders are generated each year, and the company sells the scrap to metal recyclers. In the past, the facility disposed of these scrap cylinders in the cylinder disposal area and, possibly, in the quarry pond. No records were found as to whether the scrap cylinders disposed in SWMU-5 and SMWU-7 were emptied before disposal.

The facility is within a 100-year flood plain. The tar pit, the quarry pond, and Sugar Run Creek are approximately 10 feet lower than most of the facility and are not designed to withstand a flood. The nearest surface water body, Sugar Run Creek, is on the facility property. It flows west and then north for about 1 mile from the facility where it discharges to the Des Plaines River. Des Plaines River is used for recreational purposes only, with no surface water intakes within 15 miles downstream of the facility. Surface water runoff probably flows south or west from the facility where it enters a wooded area and then flows into Sugar Run Creek. On a larger scale, surface drainage is toward the Des Plaines River that is approximately 1 mile west of the facility.

Residents in the Matheson Gas area use groundwater from either private wells or public water supplies. Private and public drinking water wells in this area, other than the Joliet municipal wells, draw water from a shallow aquifer called the Silurian dolomite aquifer. An aquifer consists of rock or rock materials that are sufficiently permeable to conduct groundwater and to yield sufficient quantities of water to wells and springs. Private wells range from 50 to 340 feet deep, and public wells range from 50 to 360 feet deep. The Joliet municipal wells obtain water from the hydrologically connected rocks called the Cambrian-Ordovician aquifer system at depths between 1,400 and 1,700 feet.

If groundwater flows in the direction of local topographic features, regional groundwater flow would be toward the Sugar Run Creek and the Des Plaines River. Groundwater from the tar pit would flow in a westward direction, while groundwater from the quarry pond would flow south.

Children have played in the west and south wooded areas next to the property. Sugar Run Creek and Des Plaines River are used for recreational purposes. According to a facility representative, the quarry pond is used for recreational fishing, but no one eats the fish. Groundwater is used as an industrial, municipal, and private water supply. The nearest drinking water well is on the facility property and can be used for drinking by the employees at the facility. Approximately 20 public water supply systems and 674 private wells tap the Silurian Dolomite aquifer and serve 7,169 residents within a 4-mile radius of the site. This total does not include industrial and commercial wells that may supply water to employees. The closest public supply well is less than 0.25 miles north of the facility in the Clearview subdivision. No wellhead protection areas exist near the site.

Sensitive environments within a 15-mile downstream distance of the site include a state wildlife refuge and state-designated habitats used by threatened and endangered species.

The approximate number of individuals living within a 4-mile radius of the site are as follows:

On-site	0-¼ mile	¼-½ mile	½-1 mile	1-2 miles	2-3 miles	3-4 miles	Total
26	306	1,224	4,590	16,830	29,070	26,010	78,056

On March 20, 1997, IDPH staff visited the site with the Matheson Gas branch manager. A locked gate on the east side and a wire fence on the east and north sides of the property restrict access to the property. A "DANGER -- KEEP OUT" sign was posted on both the north and southeast borders of the fence. Administrative buildings and the covered dock for deliveries were on the right side of the entrance gate. The quarry pond was on the left side upon entry. Trees and bushes surrounded the pond, but the pond was not fenced. A pile of empty wood boxes and racks of scrap cylinders were in the dumpster area. Scrap cylinders contained in metal rails were also in the scrap cylinders accumulation area. The tar pit was in the upper northwestern corner of the property and was double-fenced by a wooden fence near the pit and a cyclone fence outside it. The wooden fence was about 2.5-3 feet high, and the cyclone fence was about 6 feet high. Both fences were inclined, making them easy to climb, approximately 20 to 30 degrees toward the pit on its south border. The area was besieged with heavy rain and wind two days before the site visit, so gullies and broken branches were on the ground in the wooded areas. A "NO TRESPASSING" sign was posted on the southern border of the site along Sugar Run Creek.

The facility has had no compliance problems in the past but has a history of odor complaints from area residents. Local residents have complained of odors coming from the open surface of the tar pit and from an oil-like substance reportedly present in residential water supplies. During the SSI, a photo-ionization detector with a 11.7 eV lamp was used to determine the presence of certain airborne contaminants, but no readings above background levels were observed. In January 1997, IDPH staff collected samples of unfiltered water from a residential water supply of a home approximately 400 feet south of Matheson Gas and found no contaminants of health concern. IDPH recommended no changes in the use of residential water supply (4).

DISCUSSION

The groundwater, soil, and sediment samples collected in 1991 and 1995 are the subject of the present review. The purpose of the sampling was to compare on-site samples with downgradient and background samples. The locations of 1991 samples (3 groundwater and 9 soil and sediment samples) are presented in Attachment 5. No sampling location map was available for the samples (3 groundwater and 10 soil and sediment samples) taken in 1995, but the small site area makes the exact sample locations less important. All 3 groundwater samples taken in 1991 were collected upgradient to the tar pit: GW1 from the on-site industrial/washroom well, GW2 from a residential private well approximately 400 feet south of the site, and GW3 from a subdivision public well about 0.25 miles north of the site, which was also used as a background sample. In 1995, groundwater samples were collected from on-site wells (G101, G102) and a residential private well (G103).

Soil and sediment samples collected in 1991 were from 0 to 6 inches in depth. Because each core sample represented a mixed sample, it was impossible to separate data on surface soil (less than or equal to 3" deep) from data on subsurface soil (more than 3" deep). Sample S1 served as the background reference. The appearance and locations of these samples are presented in Table 2. The description and exact locations of the 1995 soil and sediment samples were not available for review. The background samples are S101 and S201. Sample S102 is sediment from the quarry pond, S103-105 are from the surface soil, and S202-205 are from the former creek beds.

The Quality Assurance/Quality Control (QA/QC) summary for 1991 sampling was obtained from IEPA. It states that field data and sampling quality during the site assessment were satisfactory. No analytical problems were noted in the QA/QC summary. No QA/QC summary for 1995 sampling was available for review, but in preparing this health assessment, IDPH assumes that adequate QA/QC measures were followed during the sampling, laboratory procedures, and data reporting. IDPH also assumes the soil and sediment samples are representative of surface soil.

During the site visit, IDPH noted that access to the site from the western and southern sides of the property is limited only by a wooded area and Sugar Run Creek. Children have occasionally played in these wooded areas, and, though improbable, they could enter the site. The quarry pond is not fenced and is a physical hazard because trespassers, especially children, could fall in it. The tar pit is double fenced, but both fences are inclined toward the pit and would be easy to climb.

The contaminant concentrations detected in samples taken in 1991 and 1995 were compared with appropriate comparison values (see Attachment 6 for explanation of comparison values) to select contaminants that may pose a public health threat upon exposure. The levels of metals were compared with IEPA mean concentrations from urbanized areas expected to represent naturally occurring soil background in Illinois (5). Chemicals exceeding comparison values and those for which no comparison values were available, were selected for further evaluation for both exposure and for non-carcinogenic and carcinogenic effects if exposure occurs. These contaminants, their concentrations from both 1991 and 1995 sampling events, and the appropriate comparison values are presented in Table 3 (for soil) and Table 4 (for groundwater). Table 5 lists the contaminants found in samples collected in 1991 and 1995 that were at levels greater than comparison values.

Exceeding a comparison value does not mean that adverse health effects will occur upon exposure. The amount of the contaminant, as well as the duration and route of exposure, and the health status and receptivity of exposed individuals, are important factors in determining the potential for adverse health effects. The cancer potency of polycyclic aromatic hydrocarbons (PAHs) was estimated based on their relative potency to benzo(a)pyrene (BaP) by using USEPA Toxicity Equivalency Factors (TEFs).

An exposure pathway consists of a source of contamination, environmental media and transport mechanisms, a point of exposure, a route of exposure, and a receptor population. Exposure to a contaminant may have occurred in the past, may be occurring now, or may occur in the future.

When all the five elements that link the contaminant source to an exposed population are known, a completed exposure pathway exists. When information on one or more of the five elements is missing, only a potential exposure pathway exists. Completed and potential exposure pathways at Matheson Gas are presented in Table 6.

Of the contaminants selected, BaP, chrysene, arsenic, and lead may pose a health risk to people if they are exposed to concentrations present in the contaminated soil and sediment on the site. Cadmium was found in the tar pit at elevated levels, but it is known to cause cancer only by inhalation and intramuscular injection. Ingestion of cadmium may cause adverse, non-cancer effects, but no one would likely ingest enough cadmium present in the tar pit to cause any adverse effects. Exposure to contaminated soil and sediment by ingestion or skin contact is unlikely to cause cancer. The low concentrations of the other contaminants are unlikely to cause adverse health effects. The highest concentrations of contaminants capable of causing adverse health effects were inside and at the edges of the tar pit, the quarry pond, and the dry former creek beds. High levels of iron and manganese were found in all groundwater samples taken in 1991, including the off-site background well. They can produce an unpleasant taste or water appearance and contribute to the deposition of scale on pipe walls, but these chemicals are unlikely to affect health at the levels found. None of the 1995 on-site and off-site groundwater samples contained contaminants at levels that exceeded comparison values.

Currently, no hazardous waste is generated at Matheson Gas, but contaminants from the past refinery activities exist at the site. Past, current, and future completed exposure pathways are present for contaminated surface soil and sediment at several on-site points of exposure: the tar pit, quarry pond, and dry creek beds. The 1991 and 1995 comparative levels of contaminants of concern (BaP, chrysene, arsenic, and lead) at these locations are presented in Table 7. The tar pit holds refinery waste that is still contained in the unit, but there are no controls to prevent a release. In the 1991 tar pit samples, chrysene measured 44 milligrams per kilogram (mg/kg) and lead measured 318 mg/kg. No analytical results were available for samples taken in 1995.

The quarry pond, which poses a drowning hazard, is an active unit that manages wastewater discharge and where scrap cylinders have been disposed in the past. It has no release controls. In the Quarry Pond 1991 sampling, arsenic was present at 27.7 mg/kg, and lead was present at 378 mg/kg. BaP and chrysene were not detected. The quarry pond is used for fishing. Although some fish bioaccumulate arsenic in their tissues, most of this is in a non-toxic form (6). Moreover, facility personnel reported that no one eats the fish. In the 1995 sampling, BaP was present at 3 mg/kg, chrysene at 5.3 mg/kg, and arsenic and lead were not detected. While the tar pit and quarry pond are waste management units, the dry former creek beds contamination suggests that on-site chemicals migrated downgradient from the site. In the 1991 dry creek bed samples, chrysene was present at 5.5 mg/kg, lead at 318 mg/kg, and BaP and arsenic were not detected. In 1995 samples, BaP was present at 5.4 mg/kg, chrysene at 5.9 mg/kg, and lead at 1,410 mg/kg.

IDPH compared the 1991 and 1995 contaminant levels and found an increase in the levels of BaP and lead over time. BaP was not detected in the Quarry Pond and former creek beds samples in 1991, but BaP exceeded comparison values in the 1995 samples. Lead levels in the former creek beds rose from about 4 times the Illinois soil background level in 1991 to about 20 times the background level in 1995. If no hazardous waste is currently generated at Matheson Gas, then the source of these increased pollutants levels might be a recent migration from past refinery activity sites, the corroded scrap cylinders buried 20 to 30 years ago, or an unknown activity at the site or in the vicinity.

The 26 on-site workers and occasional trespassers are exposed by ingesting contaminated soil and sediment found in the dry creek beds, the tar pit, and the quarry pond as they work in those areas. There are fences to restrict the access to the tar pit, but they were partially down during the site visit and were easy to climb. No fences exist around the quarry pond and along the western and southern borders of the property. The posted warning signs may not be enough to deter trespassers, especially children. High lead levels in soil and former creek beds are especially harmful to children if they play at the site.

Present and future potential exposures may result if contaminants from the surface soil are blown into the air or migrate to the groundwater where the private wells draw water. Of the 26,010 residents within a 4-mile radius of the site, about 7,169 residents are served by private well water and could be exposed by drinking, inhaling, or direct skin contact with contaminated water in their homes if private wells become contaminated. Data available for review do not adequately characterize the migration of contaminants into the groundwater because all groundwater samples taken in 1991 were collected upgradient of the tar pit and former creek beds, and only one sample was collected on the site. The tar pit manages past refinery waste, and former creek beds contain contaminants that likely migrated from the site. Also, no surface water sampling was done. Surface water runoff and groundwater flow into Sugar Run Creek, and the creek itself might carry site contaminants further downstream. The tar pit and the quarry pond are open water surfaces, and contaminants may volatilize into the air and reach nearby yards and houses. Contaminated surface soil particulates may also be windblown nearby.

The results of human and animal studies suggest that arsenic is a known human carcinogen, while BaP (7), chrysene, and lead are probable human carcinogens. Adults employed at the site for at least 15 years, might have a low increased risk of developing cancer, assuming they ingest 100 milligrams (mg) of the contaminated soil and sediment daily. If cancer occurs, it would most likely be cancer of the skin, lung, or liver. To increase their risk of getting cancer, children must play on the site daily for 6 months every year for at least 5 years and ingest 200 mg of contaminated soil and sediment each day. This scenario is very unlikely to occur.

Lead may also cause noncancerous adverse health effects if people, especially children, are exposed to concentrations found in the on-site soil and sediment samples (8). Lead can affect almost every organ and system in the body. Most sensitive is the central nervous system, particularly in children. Lead also damages the kidney and the immune system. The effects are

the same whether lead is inhaled or swallowed. Exposure to lead poses the greatest danger to young and unborn children exposed through their mothers. Harmful effects include premature births, decreased birth weight, decreased mental ability in the infant, learning difficulties, and reduced growth. In adults, lead may cause headache, fatigue, slow reaction time, and weakness in fingers, wrists, or ankles. Lead may damage the blood-forming system and cause anemia. Some lead compounds have been shown to cause cancer in animals; however, no sufficient data exist to attest to the potential cancer risk in humans.

CONCLUSIONS

Based on the information reviewed, IDPH concludes:

1. The Matheson Gas Products, Inc., site poses a public health hazard because of the drowning hazard posed by the Quarry Pond and because of the opportunity for chronic exposure to lead, benzo(a)pyrene, chrysene, and arsenic that could cause adverse health effects. The site is not completely fenced to restrict access to the Quarry Pond, and the double fence surrounding the tar pit is partially down and easy to climb. Trespassers, especially children, could fall and drown in the pond and pit. On-site workers and trespassers may ingest contaminated soil and sediment. Lead exposure can cause decreased IQ scores, growth retardation, and hearing problems in children, and headache, fatigue, weakness in wrists and ankles in adults. Workers exposed over many years to benzo(a)pyrene, chrysene, and arsenic might increase the risk of getting cancer over their lifetime.
2. The existing data do not adequately characterize the surface soil contamination or the contaminant migration into the groundwater.
3. No data exist to assess the surface water quality and the contamination in the Cylinder Disposal Area where scrap cylinders were used as fill material. The cylinders have been buried for 20 to 30 years and may be corroding and releasing contaminants into groundwater, surface water, and air.

RECOMMENDATIONS

IDPH recommends that IEPA:

1. Restrict access to the site. Maintain fences around the tar pit.
2. Collect data to assess the surface soil contamination adequately (less or equal to 3 inches deep) and the contaminant migration into the groundwater, especially downgradient of the tar pit.
3. Collect data to assess the surface water quality and the status of buried scrap cylinders.

4. Reduce the potential for migration of on-site contaminants to off-site areas.

PREPARER OF REPORT

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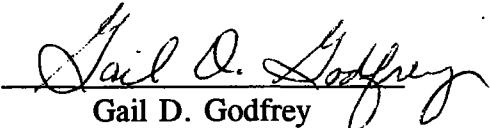
Tables 1-7
Attachments 1-6

REFERENCES

1. IEPA: "CERCLA Screening Site Inspection Report". Matheson Gas Products, Inc. June 1991.
2. USEPA: "Preliminary Assessment/Visual Site Inspection". Matheson Gas Products, Inc. Final Report. January 1994.
3. Interoffice mail from IEPA, Sheri Adams, to IDPH, Constanta Mosoiu. March 6, 1997.
4. Letter from Aparna Kaul, IDPH, to George Pierson. March 9, 1997.
5. IEPA: "A Summary of Selected Background Conditions for Inorganics in Soil" (Within Metropolitan Statistical Areas). August 1994.
6. ATSDR: "Toxicological Profile for Arsenic" (Update). February 1992.
7. ATSDR: "Toxicological Profile for Polycyclic Aromatic Hydrocarbons" (Update). August 1995.
8. Agency for Toxic Substances and Disease Registry (ATSDR): "Toxicological Profile for Lead" (Update). December 1992.

CERTIFICATION

This Matheson Gas Products, Inc., Health Consultation was prepared by the Illinois Department of Public Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.


Gail D. Godfrey
Technical Project Officer
Division of Health Assessment and Consultation
ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health consultation and concurs with its findings.

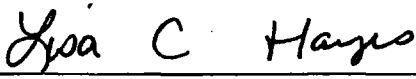

for Richard E. Gillig
Chief, State Programs Section
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ATSDR

Table 1. Solid Waste Management Units (SWMUs).

SWMU Number	SWMU-Name	Status	Current Wastes /Source
1	Wastes Liquids Room	Active; manages scrubber effluent waste and wastewater	Remnant gas/ Returned cylinders Scrubber effluent waste/ Neutralization process Wastewater/ Wash water, cooling water, testing water Spent filters/ Wastewater treatment
2	Scrubber Unit	Active; neutralizes scrubber liquid	Remnant gas / Returned cylinders Scrubber effluent / Neutralization process
3	Former Hazardous Waste Storage Area	Active; manages nonhazardous waste	Remnant gas/ Returned cylinders Scrubber effluent waste/ Neutralization process
4	Thermal Oxidizer	Active; incinerates hydrocarbons	Remnant gas/ Returned cylinders
5	Cylinder Disposal Area	Inactive; formerly used to dispose of scrap cylinders	Scrap cylinders/ Failed cylinders
6	Scrap Cylinder Accumulation Area	Active; manages non-hazardous scrap cylinders	Scrap cylinders/ Failed cylinders
7	Quarry Pond	Active; receives body of wastewater discharge	Scrap cylinders/ Failed cylinders Wastewater/ Wash water, cooling water, testing water
8	Tar Pit	Inactive; managed refinery wastes before 1946	Refinery wastes/ Past refinery operations
9	Dumpster	Active; manages spent filters and general refuse	Spent filters/ Wastewater treatment

Table 2. Appearance and Locations of Soil/Sediment Samples Collected on June 4-5, 1991

Sample	Depth	Appearance	Location
S1	0-6"	Black soil	Background. About 300' south of the bottling building, across the Sugar Run Creek
S2	0-6"	Dark, wet sand and mud	Southern edge of the quarry pond at overflow discharge to Sugar Run Creek
S3	0-6"	Soil with black tar-like material	Along former creek bed about 35' south from the confluence of Sugar Run Creek
S4	0-6"	Dark brown soil with viscous tar material	One foot north of the fence at the northern edge of the tar pit
S5	0-6"	Black, viscous tar-like material	About 80' east of bottling building and 60' south of north fence line in the lot area
S6	0-6"	Black, viscous tar-like material	At southern end of fenced tar pit about 10' north inside the pit
S7	0-6"	Black, viscous tar-like material	Inside the pit about 18' south of the northern end of the tar pit
S8	0-6"	Brown/black mud with red discoloration	At the northern edge of the quarry pond about 30' east of discharge outfall pipe
S9	0-6"	Black/green mud	Along the discharge route, about 16' south of discharge outfall to quarry pond

Table 3. Soil/Sediment Samples. Contaminants Exceeding Comparison Values.

Contaminants	Concentration Range (mg/kg)				Comparison Values ^a (mg/kg) and Source
	On-site		Off-site/Background		
	1991	1995	1991	1995	
Semivolatiles					
Benzo(a)pyrene	ND•	0.180- 5.4	ND•	0.110- 0.073	0.1 (CREG)
Chrysene	5.1- 44	5.3- 5.9	ND•	0.140-0.090	0.640 (ATSDR) ¹
Phenanthrene	48- 110	1.8-7.7	ND•	0.140-0.052	0.140 (ATSDR) ¹
PCBs					
Aroclor 1254	2.8	ND•	ND•	ND•	1 (RMEG)
Aroclor 1260	3.2	5.0	ND•	ND•	1.5 (ATSDR) ²
Inorganics					
Antimony	34.8- 73.9	ND•	9.6	ND•	20 (RMEG)
Arsenic	27.7	ND•	7.9	8.8	20 (EMEG)
Cadmium	212.0	14.6	1.3	0.78	40 (EMEG)
Copper	192.0	252.0	26.1	25.1	156 (IEPA) ³
Lead	11-378	25.2-1410	26.5	90.9	71.1 (IEPA) ³

mg/kg = milligrams of contaminant per kilogram of soil = parts per million (ppm)

° Comparison Values are based on assumption of child exposure

• ND = Not Detected

¹ Agency for Toxic Substances and Disease Registry: "Toxicological Profile for Polycyclic Aromatic Hydrocarbons"

² Agency for Toxic Substances and Disease Registry: "Toxicological Profile for Polychlorinated Biphenyls"

³ Illinois Environmental Protection Agency: "A Summary of Selected Background Conditions for Inorganics in Soil"

Table 4. June 4, 1991. Groundwater Contaminants Exceeding Comparison Values.

Inorganic Contaminants (mg/l)	On-site well GW1	Residential well GW2	Off-site/Background GW3	Comparison Values* (mg/l) and Source
Antimony	0.0495	ND•	ND•	0.004 (RMEG)
Iron	2.670	1.550	1.110	1.0 (MCL) ¹
Manganese	0.0728	0.0813	0.061	0.05 (SMCL) ²
Vanadium	0.0291	0.0732	0.0341	0.030 (EMEG)

mg/l =milligrams of contaminant per liter of liquid

° Comparison values are based on assumption of children exposure

• ND = Not Detected

¹ IDPH Maximum Levels for Contaminants in Public Water Supplies

² USEPA Drinking Water Regulations and Health Advisories

Table 5. Sample Locations with Concentrations Exceeding Comparison Values.

Contaminants	1991	1995
Benzo(a)pyrene	ND	S101*, S102, S203, S204
Chrysene	S4, S6	S102, S203
Phenanthrene	S5, S6, S7	S102, S203
Aroclor 1254	S9	ND
Aroclor 1260	S9	S203
Antimony	GW1, S2, S3, S5, S8, S9	ND
Arsenic	S8	ND
Cadmium	S4	ND
Copper	S9	S203
Lead	S4, S5, S6, S9	S101*, S203
Iron	GW1, GW2, GW3*	ND
Manganese	GW1, GW2, GW3*	ND

*Off-site/Background sample: S101, GW3

The Tar Pit: S4, S6, S7

The Quarry Pond: S2, S8, S9, S102

Former creek beds: S3, S203, S204

Soil: S5

On-site: GW1

Residential Well: GW2

ND=Not Detected Above Comparison Values

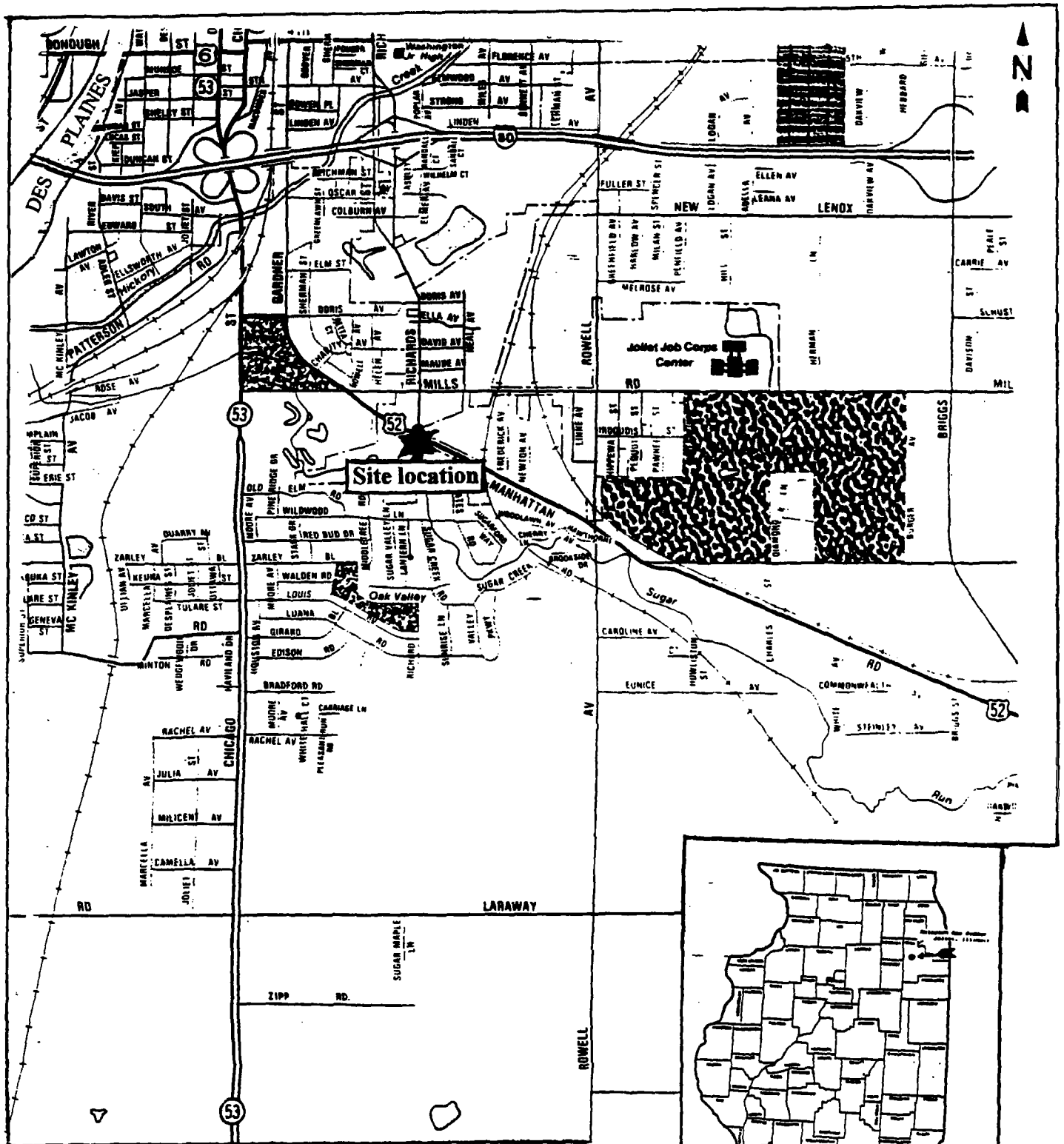
Table 6. Completed and Potential Exposure Pathways^o

Pathway name	Exposure Pathway Elements					Time
	Source	Environmental medium	Point of exposure	Route of exposure	Exposed population	
Completed Exposure Pathways						
Surface soil	Matheson Gas (past refinery activities)	Surface soil	Former creek beds	Ingestion	On-site workers= 26 Trespassers (estimated number= 10)	Past Present Future
Sediment	Matheson Gas (past refinery activities)	Sediment	The Tar Pit The Quarry Pond	Ingestion	On-site workers= 26 Trespassers (estimated number= 10)	Past Present Future
Potential Exposure Pathways						
Private wells	Matheson Gas (past refinery activities)	Groundwater ° (private wells)	Residences	Ingestion Inhalation Skin contact	Residents within 4 - mile radius= aprox.7,200	Present Future
Ambient air	Matheson Gas (past refinery activities)	Air°	Nearby yards & buildings	Inhalation	Residents within ½ - mile radius= aprox.1,224	Present Future

^oThe missing component that make the pathway potential rather than completed is presented in *italic*.

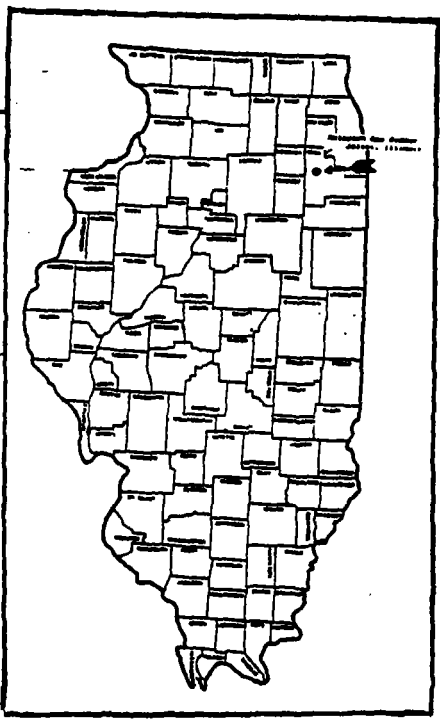
Table 7. Comparative Levels of 1991 and 1995 Soil/Sediment Contaminants of Concern

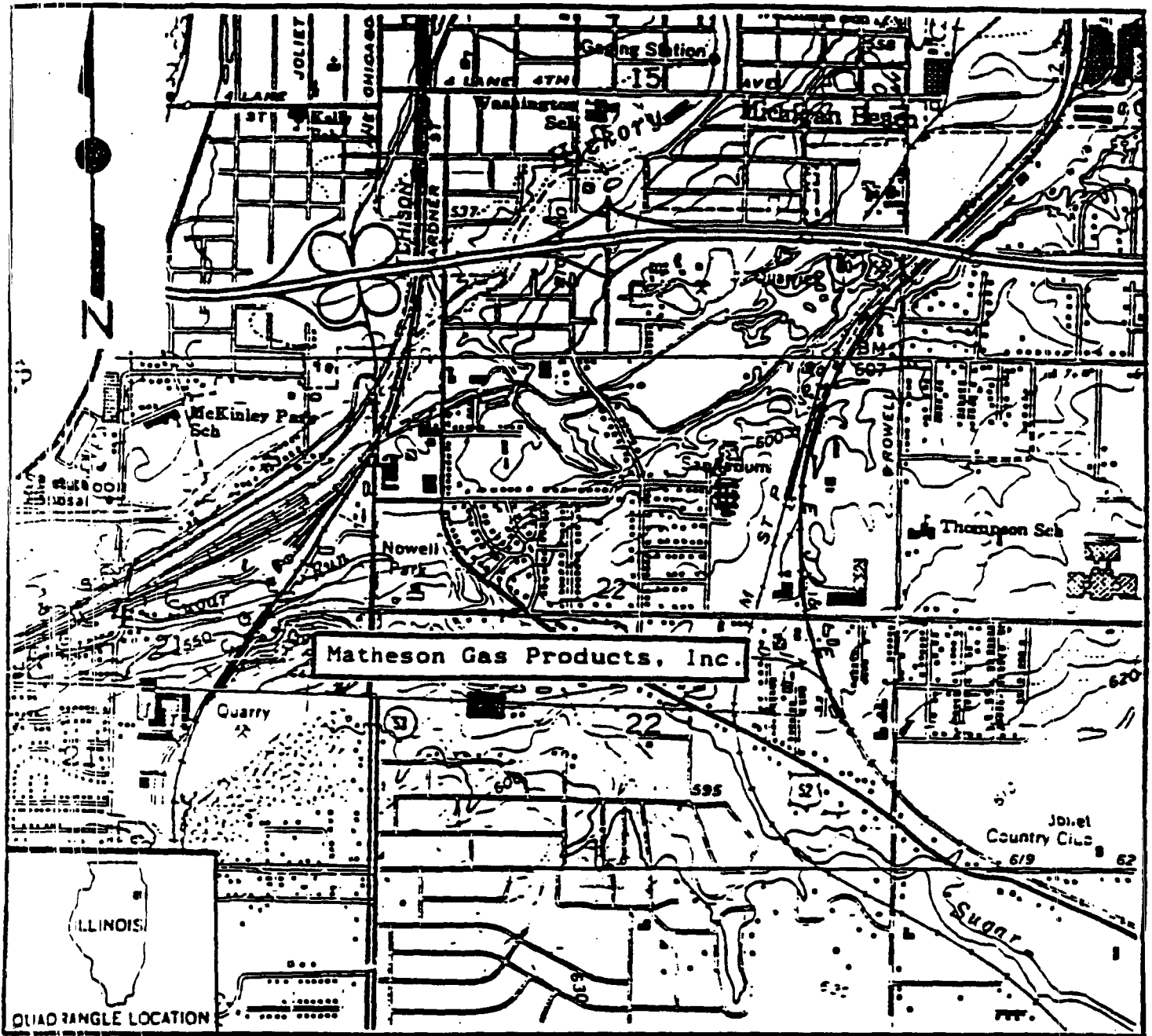
Contaminants mg/kg (ppm)	Quarry Pond		Tar Pit		Former Creek Beds	
	1991	1995	1991	1995	1991	1995
Benzo(a)pyrene	Not detected	3.0	Not detected	Not available	Not detected	5.4
Chrysene	Not detected	5.3	44.0	Not available	5.4	5.9
Arsenic	27.7	Not detected	Not detected	Not available	Not detected	Not detected
Lead	378.0	Not detected	197.0	Not available	318.0	1,410.0



MATHESON GAS PRODUCTS, INC.
JOLIET, ILLINOIS

SITE LOCATION

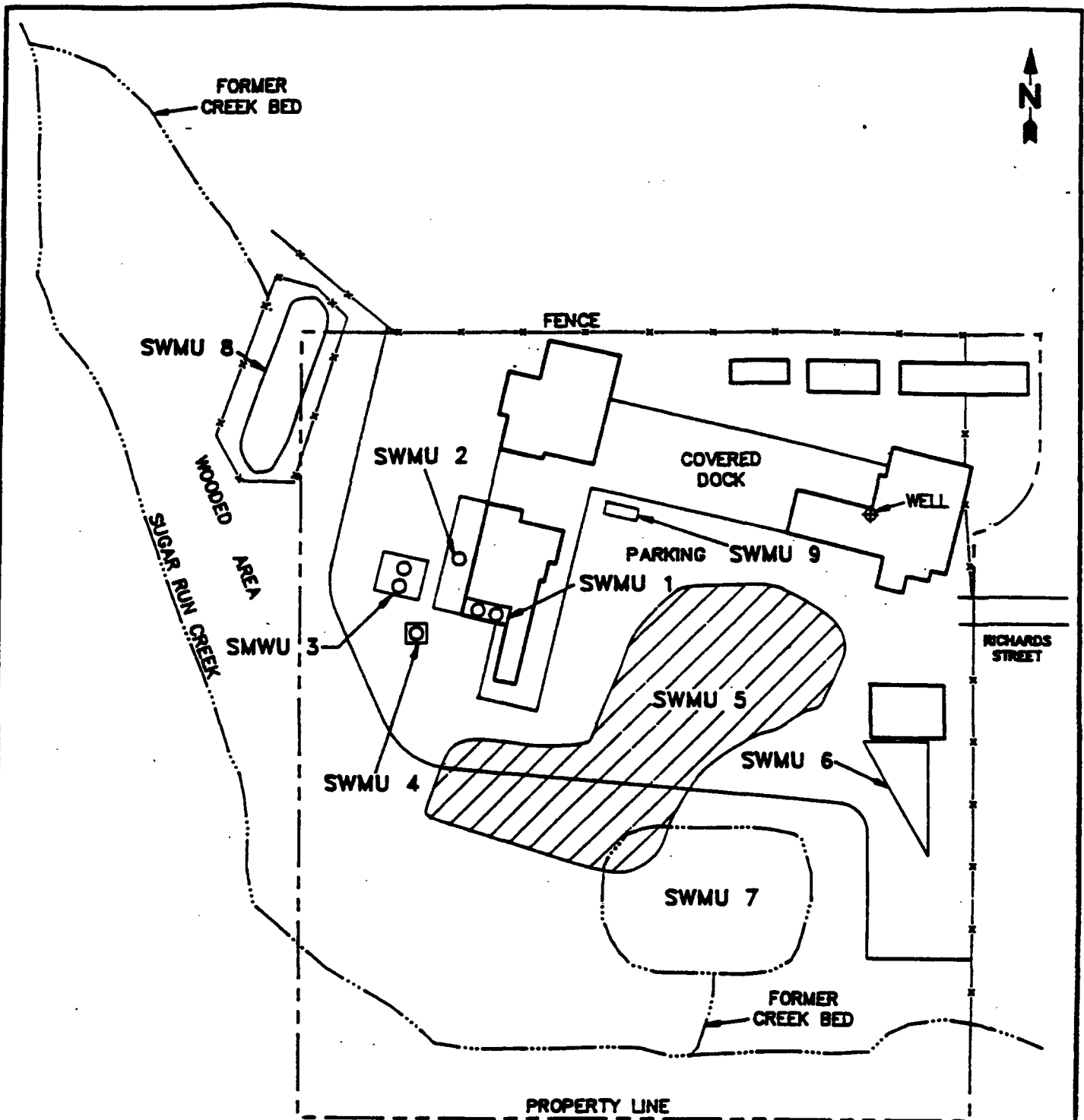




SOURCE: IEPA, 1989. BASE MAP: USGS 1973 Elwood, IL and 1973 Joliet, IL Quadrangles.

1000 2000 3000 4000 5000 6000 7000 FEET

Site Area

**LEGEND**

- SWMU 1 WASTE LIQUIDS ROOM
- SWMU 2 SCRUBBER UNIT
- SWMU 3 FORMER HAZARDOUS WASTE STORAGE AREA
- SWMU 4 THERMAL OXIDIZER
- SWMU 5 CYLINDER DISPOSAL AREA
- SWMU 6 SCRAP CYLINDER ACCUMULATION AREA
- SWMU 7 QUARRY POND
- SWMU 8 TAR PIT
- SWMU 9 DUMPSTER

50' 0 50' 100'

SCALE: 1" = 100'

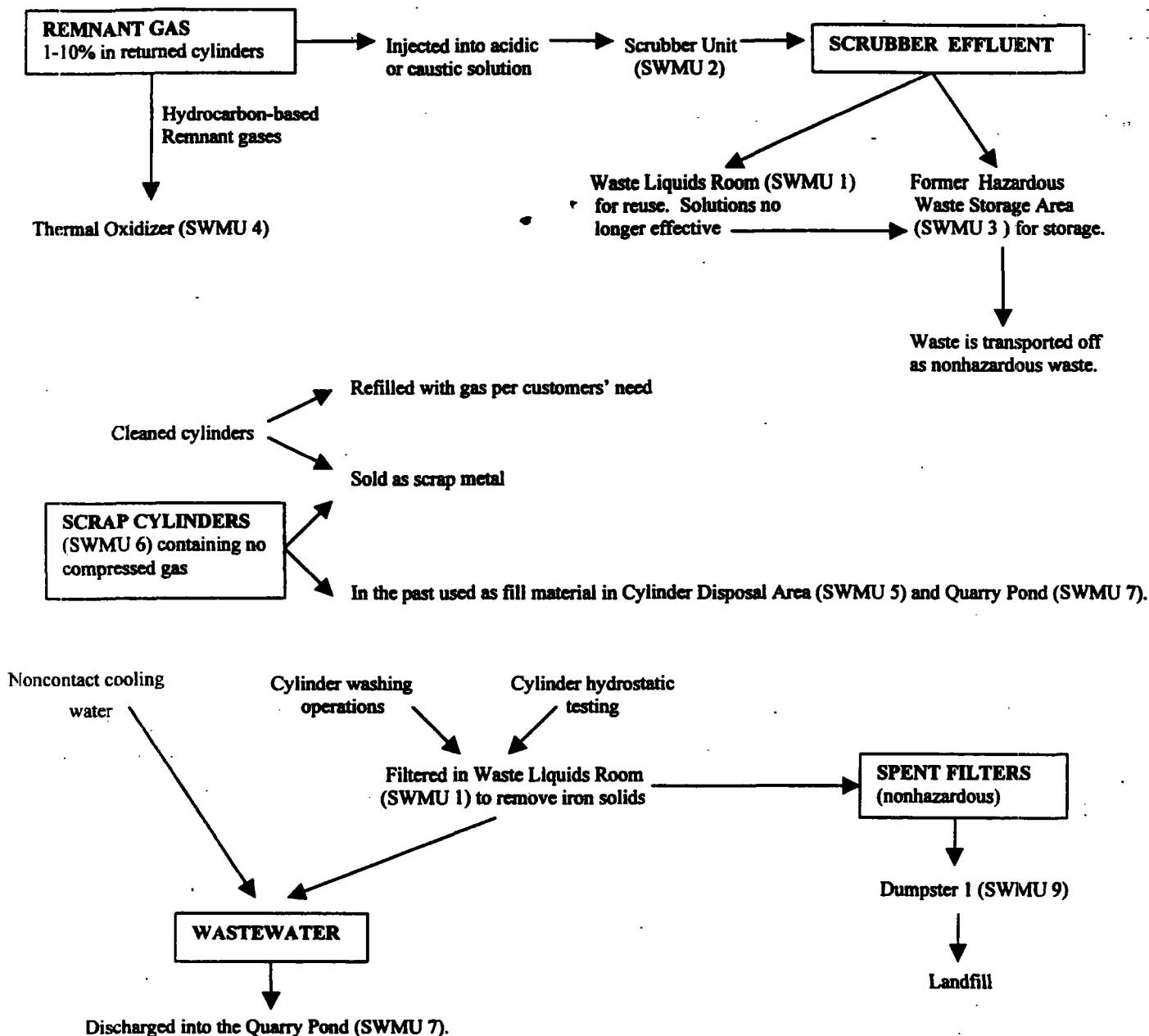
MATHESON GAS PRODUCTS, INC.
JOLIET, ILLINOIS

FACILITY LAYOUT

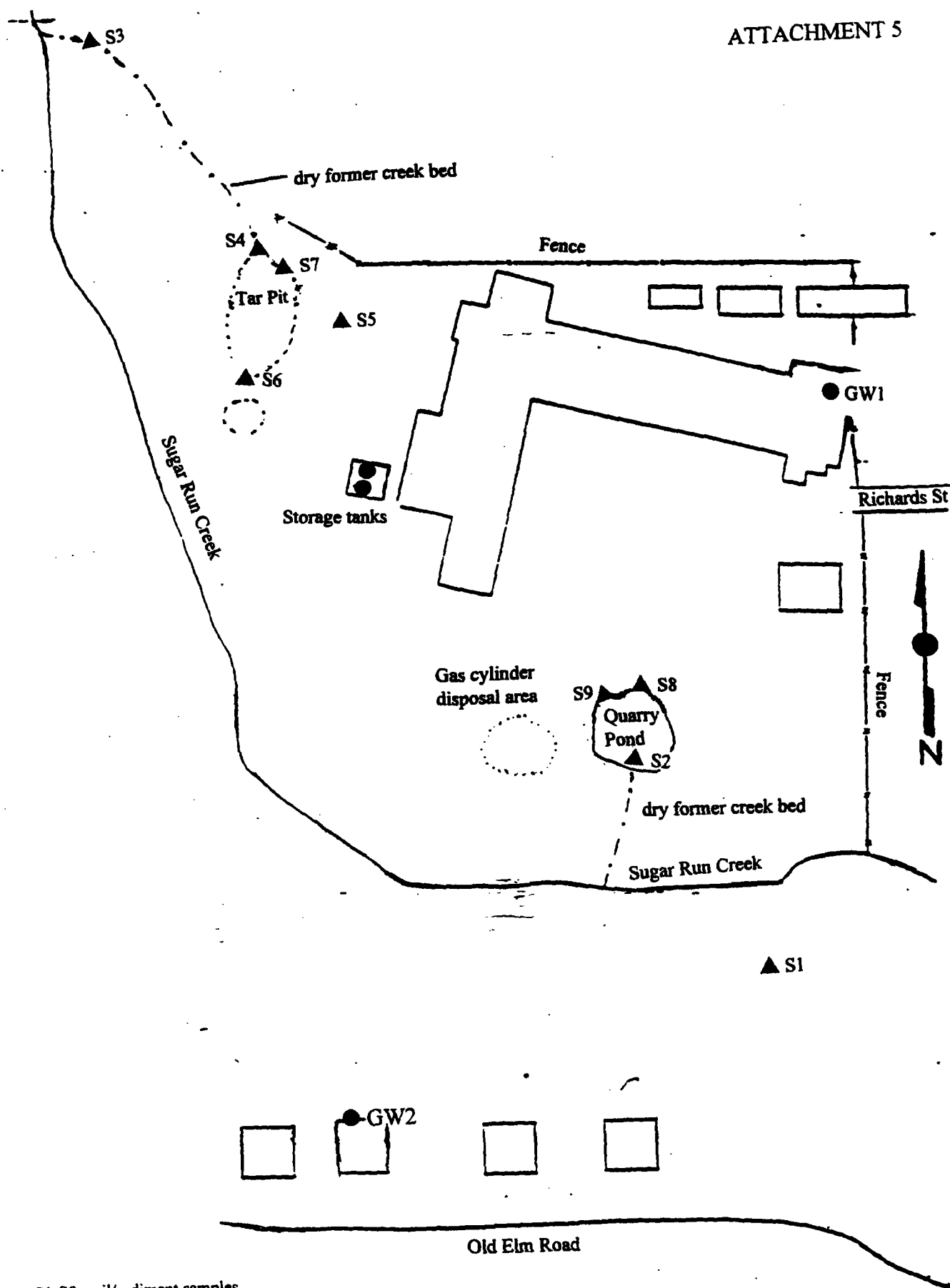
PMC ENVIRONMENTAL MANAGEMENT, INC.

ATTACHMENT 4

Nonhazardous Waste Generated by Facility Operations. (Remnant gas, scrubber effluent waste, wastewater, spent filters, and scrap cylinders)



Before 1946 an unknown quantity of refinery wastes was disposed off in the Tar Pit (SWMU 8).



- ▲ S1-S9: soil/sediment samples
- GW1, GW2, GW3: groundwater samples
- GW3: public well located 1/4 mile north of the site

1991 SAMPLING LOCATION MAP

Comparison Values Used In Screening Contaminants For Further Evaluation

Environmental Media Evaluation Guides (EMEGs) are developed for chemicals based on their toxicity, frequency of occurrence at National Priority List (NPL) sites, and potential for human exposure. They are derived to protect the most sensitive populations and are not cut-off levels, but rather comparison values. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Reference Dose Media Evaluation Guides (RMEGs) are another type of comparison value derived to protect the most sensitive populations. They do not consider carcinogenic effects, chemical interactions, multiple route exposure, or other media-specific routes of exposure, and are very conservative concentration values designed to protect sensitive members of the population.

Cancer Risk Evaluation Guides (CREGs) are estimated contaminant concentrations based on a one excess cancer in a million persons exposed to a chemical over a lifetime. These are also very conservative values designed to protect sensitive members of the population.

Maximum Contaminant Levels (MCLs) have been established by USEPA for public water supplies to reduce the chances of adverse health effects from contaminated drinking water. These standards are well below levels for which health effects have been observed and take into account the financial feasibility of achieving specific contaminant levels. These are enforceable limits that public water supplies must meet.

Lifetime Health Advisories for drinking water (LTHAs) have been established by USEPA for drinking water and are the concentration of a chemical in drinking water that is not expected to cause any adverse non-carcinogenic effects over a lifetime of exposure. These are conservative values that incorporate a margin of safety.